CALFED

TECHNICAL REPORT
ENVIRONMENTAL CONSEQUENCES

URBAN RESOURCES

Including Urban Land Use, M&I Water Supply Economics, and Utilities and Public Services

DRAFT

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CALFED
BAY-DELTA
PROGRAM

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LIST OF ACRONYMS

BMP	best management practice
CALFED	CALFED Bay-Delta Program
CCWD	Contra Costa Water District
CEQA	California Environmental Quality Act
cfs	cubic foot per second
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DBP	disinfection by-product
DOC	dissolved organic carbon
DWR	California Department of Water Resources
M&I	municipal and industrial
MAF	million acre-feet
MWD	Metropolitan Water District of Southern California
NEPA	National Environmental Policy Act
PEIS	Programmatic EIS
ppm	parts per million
SWP	State Water Project
TAF	thousand acre-feet
TDS	total dissolved solids
THM	trihalomethane

URBAN RESOURCES

INTRODUCTION

This technical report discusses impacts on urban resources associated with implementing the CALFED Bay-Delta Program (CALFED). Urban resources include urban land use, municipal and industrial (M&I) water supply economics, utilities and public services, and social well being related to urban resources. CALFED actions could affect M&I water supply economics through water and other program costs, water supply and water quality. Water costs involve the costs of CALFED alternatives as well as the costs of other water supplies that might be developed without CALFED. Similarly, water supply involves No Action Alternative water supplies as well as CALFED supplies.

Water quality involves salinity, disinfection by-products, and numerous other water quality constituents. Water quality may be affected by CALFEDthrough several CALFED programs, through choice of delta conveyance, and through amount of water supply; the average quality of water delivered to end-users is affected by the amounts of supplies from sources of different quality.

CALFED actions could affect utilities and public services by constructing water-related facilities that require new or modified electrical services and lines. Impacts on communication, water conveyance, and natural gas infrastructure also are possible. Indirect impacts on public services could occur as a result of CALFED actions that create opportunities for M&I development or change recreational uses that require emergency services. If economic growth was stimulated by CALFED actions, indirect demands for utilities and public services to support growing communities could result from land use changes.

ASSESSMENT METHODS

Urban Land Use

Urban land use impacts could occur in two main categories: direct and construction-related impacts; and indirect and operational impacts.

Direct impacts are those changes in physical land uses, or in land use designations, which result from constructing new facilities or converting lands from one use to another. For purposes of this analysis, direct impacts of the CALFED program are those that would occur if any of alternatives, or combinations of alternatives, were implemented.

Indirect effects occur later in time and further removed in distance. Indirect land use effects would be changes in broad land use policies, resources, or economies which could result from changes in land uses, or in the long-term availability of water resources. Potential indirect and operational impacts of the program include long-term changes in the number of acres in developed use.

As a programmatic analysis, this assessment does not provide site-specific details or specific estimates of acreages or number of residences potentially affected for a given alternative.

M&I Water Supply Economics

M&I water supply economics assessment variables include:

- Water supply benefits and costs,
- Water quality benefits, and
- Water conservation benefits and costs.

Economic impacts of the Ecosystem Restoration, Water Quality, Levee System Integrity, Water Use Efficiency, and Water Transfers programs have not been quantified, primarily for lack of information on the magnitude of physical impacts and cost sharing. Impacts are described qualitatively.

WATER SUPPLY

The M&I water supply economics assessment used preliminary results from DWRSIM and alternative costs to calculate the gross benefits of new CALFED water supplies. No information on costs of CALFED alternatives was developed or used in the analysis; therefore, no judgment can be made about the potential benefit-cost relations of the alternatives.

Water supply benefits are any cost savings on water supplies acquired to meet future demands and make-up supplies acquired for use during drought. The analysis considered historical hydrology and 2020 demands. Preliminary analyses of the tradeoff between CALFED deliveries and the regional options displaced for the areas outside the Central Valley suggest that fixed-yield options (options providing the same yield every year) such as extraordinary conservation, water recycling, and ocean water desalting would be displaced by CALFED alternatives. These analyses assumed that local planners would incorporate least-cost planning principles as part of their decision criteria. The cost savings from these displaced supplies, much of which is represented by recycling, was assumed to average about $700 per acre-foot on an annual basis.

The fixed-yield options are not displaced on a one-to-one basis, however, because of the hydrologic variability of the CALFED supply. The displacement ratio varies from about 1.6 to 1.3 to one, depending on the specific CALFED alternative and assumptions about the availability of water transfers.

Within the Central Valley, local reservoir storage options are the most likely to be replaced by the supply provided by CALFED alternatives. The cost of these new facilities is expected to be about $400 per acre-foot on an annual basis The benefits in the average hydrologic condition reflect average water supply costs avoided.

DWR has provided a preliminary least-cost planning analysis for the South Coast Region. The analysis uses a system simulation framework to evaluate the value of imported water. The analysis calculates the percentage of local fixed-yield no longer cost effective under CALFED water delivery scenarios. The analysis considers the marginal trade-off between the increment of supply made available by CALFED alternatives and the regional fixed-yield options that would be built under the No Action Alternative. It also incorporates opportunities for conjunctive use and for shortage contingency water transfers.

Several other important assumptions of the M&I economic analysis are:

- No water transfers from the Central Valley were included as alternative supplies, except in the South Coast.

- Water demands are based on DWR's Bulletin 160-93 2020 levels, except for the South Coast least-cost analysis, which used Bulletin 160-98 demands and supplies.

The first factor tends to increase the value of new water significantly relative to existing and actual future conditions because water transfers recently have been, and should continue to be, a low-cost source of supplies.

In the M&I analysis, CVPIA PEIS Alternative 1 M&I deliveries are the No Action Alternative condition used to evaluate the percent change in water supply due to CALFED alternatives. The DWRSIM preliminary runs used in the analysis, the corresponding alternatives, and the increase

in critical and average M&I deliveries are shown in Table 1.

DWRSIM Run No.	CALFED Alternatives	TAF/Yr Increase in M&I Deliveries	
		Average	Critical
472	No Action, 1A, 1B	0	0
472B	2A	60	26
475	3A	90	69
498	2D	107	122
510	1C, 2B, 2E	185	235
500	3B, 3E through 3I	220	353

Table 1. Increase in M&I Water Supplies, by Alternatives.

These M&I deliveries are equal to one-third of the total increase in deliveries. The other two-thirds were allocated to agricultural and environmental uses. This allocation of water is strictly hypothetical, and it should not be inferred that benefits should be assigned or costs allocated in relation to this yield allocation.

The total increase in M&I deliveries was allocated to all Central Valley Project (CVP) and State Water Project (SWP) M&I users in the analysis according to their share of total contract or entitlement. The contract or entitlement amounts and shares are shown in Table 2.

Because of the programmatic nature of this document, the level of detail used for the analysis is necessarily preliminary in nature, and the methods and principles described above were applied more conceptually than empirically. The documentation for establishing a preferred alternative will be based on a much more detailed level of analysis.

WATER QUALITY

Water quality constituents that are important to M&I water users include salinity and related by-products, organic carbon and related by-products, bromides, turbidity, microbes, and many more parameters. Water quality of M&I supplies may be affected by the quality of source waters, but changes in quantities of supplies also are important when a provider uses numerous supplies that vary in their quality. Some providers intentionally mix supplies of various qualities to obtain water quality goals.

M&I Provider Group	TAF Contract or Entitlement	Share of CALFED Water (%)
CVP Shasta	37	1
CVP Sacramento	76	2
CCWD	167	5
CVP San Felipe	128	4
SWP North Bay	67	2
SWP South Bay	188	6
CVP San Joaquin	29	1
SWP San Joaquin	143	4
SWP Coastal Aqueduct	50	2
SWP South of Kern County	2,468	73
Total:	**3,353**	**100**

Table 2. Shares of Increased CALFED Water Supply for SWP and CVP M&I Users

The exact scope of water quality actions and the financing of the actions in terms of cost shares have not yet been determined; therefore, a comprehensive analysis of costs and benefits is not possible.

Water Quality of Delta water exports is strongly affected by the configuration of Delta conveyance and export facilities. Also, the salinity in some provider's service areas can be improved with more Delta water supplies because Delta water is blended with other, more saline supplies.

This section includes an economic analysis of salinity damages in Delta export water users' service areas for some CALFED alternatives. The economic analysis of salinity must consider quality and quantity. The hypothetical M&I one-third yield increment was allocated to water users according to their share of CVP contracts plus SWP entitlements. For example, SWP entitlement holders south of the Tehachapis receive 74% of any incremental M&I water yield, or about 25% of all CALFED yield, that results from CALFED alternatives. This yield increment is added to the No Action Alternative delivery from DWRSIM Run 472.

DWR provided estimates of end-of-month salinity at Clifton Court Forebay and Rock Slough for water years 1976 to 1991 for Configurations 1A, 1C, 2B, 2E, 3A, 3B, and 3E. Configuration 1A salinity is believed to be representative for Configuration 1B, and Configuration 2B salinity is believed to be representative for Configuration 2A. All of these results are based on DWRSIM Run 472B hydrology, so monthly data on SWP exports under Run 472B hydrology at Banks Pumping Plant were obtained. Monthly salinities at Clifton Court were multiplied by monthly exports, and the products were summed and divided by total delivery over the period to obtain flow-weighted salinity. Salinity data from Rock Slough are used for CCWD. The annual salinity estimate in this case is the simple average of the monthly average salinities. Results are provided in Table 3.

In summary, analysis is possible for Configurations 1A, 1B, 1C, 2A, 2B, 2D, 2E, 3A, 3B, and 3E. Because deliveries and salinities for Configurations 1A and 1B are identical, nine analyses are possible.

Alternative	DWRSIM Run #	SCR Delivery (TBD)	Clifton Court TDS[a] (TBD)
No Action	472	1,597	269.02
1A, 1B	472	1,597	269.02
1C	510	1,707	281.43
2A	472B	1,632	180.55
2B	510	1,707	180.55
2D	498	1,661	181.86
2E	510	1,707	177.75
3A	475	1,650	Not available
3B	500	1,727	Not available
3E	500	1,727	125.95
3H through 3I	500	1,727	Not available

NOTE:
SCR = the South Coast Region
[a] All TDS estimates assume DWRSIM Run 472B hydrology.

Table 3. South Coast Region Delivery and Salinity Estimates Used for Salinity Damages Analysis

The salinity data account only for differences in salinity caused by the different geometry of Delta conveyance and intake configurations.

Since the salinity data are all estimated from Run 472B hydrology, they do not account for any differences caused by different export amounts or storage configurations, or the timing of exports or storage releases. Therefore, economic results account for only part of the impacts of the alternatives on salinity and salinity damages. Unfortunately, it is not known whether salinity damages would be more or less if storage and export amounts and timing were accounted for.

Water quality costs of these changes in water supply and its salinity were estimated using an economic model of salinity costs. The model is based on an earlier model of salinity damages for the entire lower Colorado River basin as discussed in *Estimating Economic Impacts of Salinity of the Colorado River* (Milliken Chapman Research Group 1988).

The revised model, obtained from Metropolitan Water District of Southern California (MWD), included all of the data required to run the model for the South Coast Region and none of the data needed for the other regions included in the analysis. Data for the other regions were obtained from other sources. Bulletin 160-93 data were used to develop some data on demands and quantity of other (non-Delta) supplies. A survey of potentially affected providers was conducted; and responses provided useful information on demands, supplies, and salinity.

The model was configured to accept data for five other potentially affected regions: the South Lahontan, Contra Costa Water District, the South Bay, the San Joaquin Valley, and the Central Coast. The model obtained from MWD with data for the South Coast Region was altered to consider the CALFED alternatives in terms of quantity and salinity of SWP supplies for that region.

It is expected that economic analysis of changes in trihalomethane (THM) precursors and bromides under CALFED alternatives will be available in the future. Limited estimates of impacts based on modeled concentrations of these substances under CALFED alternatives are provided. The estimates were provided for Configurations 1A, 1C, 2B, 2D, 2E and 3E for five intake locations used by M&I providers; Contra Costa Canal, North Bay Aqueduct, Tracy Pumping Plant, Clifton Court, and Los Vaqueros Intake.

Estimates for bromide were provided as an average for dry years 1985 and 1987, and as an average over 1985 through 1987, which include the wet year 1986. For dissolved organic carbon (DOC), estimates were provided only for the 1985 to 1987 period. Some observers expect that economic benefits from reduction of THM precursors and bromides will exceed the benefits from salinity reductions.

WATER CONSERVATION

M&I providers are affected by the water conservation actions of others. They may finance other's water conservation actions, and others may participate in M&I water conservation in many ways. The CALFED Bay-Delta Program Water Use Efficiency Input Report 5-1 (CALFED 1997) provides general and specific state-wide assumptions, estimates of urban water use, and preliminary estimates of existing and future urban water conservation savings, with and without the CALFED Water Use Efficiency Program. In practice, each urban water provider would select conservation measures that are most economically feasible as part of their water supply and demand solutions.

Water conservation benefits are primarily water cost savings that depend on supply levels, and economic savings also may include end-user energy cost and wastewater treatment cost savings. Conservation costs include program

costs and end-user costs. Utilities pay the program costs of conservation programs. End-users pay some additional costs for compliance with mandatory and voluntary provisions (for example, costs of water-saving devices, time, and inconvenience).

The assessment of M&I water conservation economics is qualitative because the available quantitative information on the costs and benefits of water conservation are not reliable. Future impact analysis will consider quantitative information on these variables. Costs will be provided, and techniques will be developed to estimate benefits associated with water conservation.

Utilities and Public Services

Determination of significance of impacts is based on the application of significance criteria. Based on available information, three alternatives are reviewed and compared to the significance criteria. If the actions included in the alternative appear to trigger one or more of the criteria, then the potential impact is described to the extent possible. Potential consequences that are relevant to more than one alternative are generally described at the end of the discussion for each region.

At the programmatic level, in many instances, it is not possible to make an accurate determination of the significance of an impact. In these cases, potential impacts are described to the extent possible and significance levels identified are conservative assessments.

Impacts to the following components of existing infrastructure are evaluated by comparing the spatial distribution of infrastructure to areas of potential construction or land-use changes that would result in displacement or modification of the existing infrastructure:

- Electrical facilities and supply,
- Water conveyance facilities,
- Natural gas fields and storage reservoirs;
- Underground pipelines,
- Communication facilities, and
- Police, fire, and emergency services.

For the purpose of this Programmatic EIS/EIR, "infrastructure" shall refer to all the elements presented above except police, fire, and emergency services.

Because specific sites have not been selected for development of storage and conveyance facilities, any locations discussed are examples to illustrate the type of facility being considered.

In the assessment process, the following related resource analyses may be utilized:

- Land use,
- Power production economics,
- Water facilities and operations,
- Recreation resources,
- Regional economics, and
- Flood control.

Due to the programmatic level of detail for the project alternatives, the impacts presented in this section are general in nature. Additional information would be needed for more specific conclusions.

SIGNIFICANCE CRITERIA

Urban Land Use

The following impacts would potentially be considered significant urban or developed land use effects of the project:

- Displacement of residents, and
- Inconsistency with land use objectives of local and regional plans.

With respect to urban land use, this report considers whether the project would: 1) be incompatible with existing land uses in the vicinity; 2) conflict with applicable

environmental plans or policies adopted by agencies with jurisdiction over the project; 3) conflict with general plan designations or zoning; or 4) disrupt or divide the physical arrangement of any established community.

M&I Water Supply Economics

Both the California Environmental Quality Act (CEQA) and NEPA require a discussion of economic effects, and some CALFED actions will have both economic benefits and costs. Under both NEPA and CEQA, economic impacts, by themselves, are not considered significant; they may, however, be used to determine if economic changes result in significant physical or environmental effects. Therefore, economic effects are considered only as a measure by which physical effects can be judged.

The economic impacts are categorized as either adverse or beneficial. An economic impact might be considered adverse if its costs are expected to be larger than its benefits, and an impact might be considered beneficial if its benefits exceed its costs.

For purposes of this analysis, a substantial increase in water supply is considered beneficial. It does not imply that the net benefit is positive (that benefits exceed costs, or that the costs are less than alternative sources of supplies).

For water quality impacts, a reduction in total dissolved solids (TDS) of Delta export water was considered beneficial if the reduction is more than 20% of the No Action Alternative concentration. An increase in TDS of Delta export water was considered adverse if the increase is more than 20% of the No Action Alternative concentration. Impacts on disinfection by-product (DBP) precursors were analyzed by inspection of bar graphs. Beneficial impacts are a reduction of approximately 20 percent or more of No Action Levels.

Utilities and Public Services

To determine the thresholds at which impacts become significant, draft threshold criteria have been developed.

Significance criteria for identifying impacts to utilities and public services are based on the displacement or modification of facilities and services due to either water-related facility development or economic stimulation. The facilities and services which may be impacted include the infrastructure discussed above and police, fire, and other emergency services.

Threshold criteria associated with water-related facility development include:

- Demand for utilities that exceeds the capacity and outputs of existing infrastructure and requires new infrastructure or utility facilities;
- Demand for public services that substantially exceeds the capacity of public service agencies;
- Intersection with major infrastructure components requiring relocation of the components; and
- Increase in the anticipated risk of gas line rupture, especially to gas lines crossing exterior levees.

ENVIRONMENTAL CONSEQUENCES

Comparison of No Action Alternative to Existing Conditions

ALL REGIONS

URBAN LAND USE

The key changes between current conditions and No Action Alternative conditions that will affect land use involve converting land uses to accommodate storage and conveyance facilities associated with reasonably foreseeable future actions, including the CVPIA and Los Vaqueros projects. The intensity and magnitude of specific urban land use impacts (versus impacts to agricultural or open space lands) would depend upon the actual location of the modifications and improvements to be implemented under the No Action Alternative. Such projects could displace residents, disrupt or divide existing communities, or be inconsistent with local or regional land use plans.

M&I WATER SUPPLY ECONOMICS

The No Action Alternative displays the state of water supply economics for a 2020 level of development as opposed to the existing (current) conditions. The 2020 level of development is expected to result in substantial increase in demand for M&I water because of the increase in population and urban water use over time.

Table 4 shows characteristics of M&I provider groups for the existing condition and the No Action Alternative. Water prices, costs and estimates of 2020 demands were obtained from DWRs Bulletin 160-93 and information provided by M&I water providers.

The No Action Alternative includes a number of projects that will reduce Delta export constraints, as discussed in the region-specific sections. Under existing conditions, there are times when Delta conveyance or pumping capacity limits exports. At other times, water is available in the Delta, and excess pumping capacity exists, but no immediate demand or storage space is available to utilize the water. New south-of-Delta storage and conveyance projects built between now and 2020 will reduce the export constraints that are currently a limiting factor.

Delta Region

For purposes of preliminary impact analysis of water supply changes, economic impacts in CCWD are used to represent economic impacts of the alternatives in the Delta Region. The major reason for this assumption is that other M&I water supplies for most other providers in the Delta, for providers in Sacramento and Stockton, and for numerous small providers would not be affected by the alternatives in ways that can be measured at this time. In the following discussion, the term "Delta providers" is reserved for any and all providers actually located within the statutory Delta.

Table 4 shows some characteristics of CCWD in the existing and No Action conditions. Current demand is about 150,000 AF, which includes 10,000 AF of direct diversions by industrial customers. Retail cost to residential customers is currently about $700 per AF; and price, which does not include service charges, is about $450. About one-third of demands are commercial and industrial. Demand is expected to rise to 175,000 AF by 2020, with slightly higher demands in dry years due to less natural precipitation and subsequent recharge of urban landscapes.

The No Action Alternative retail cost and price are higher than existing conditions because of conservation, CVPIA costs, and costs of new supplies. The average condition supply deficit is about 5,000 AF.

Condition Variable	Delta Region (CCWD)[a]	Bay Region (not CCWD)	Sacramento River Region	San Joaquin Region	Other SWP Service Areas
Existing Condition					
TAF average demand	150	707	566	337	3,784
TAF dry year demand	150	767	613	344	3,916
Typical retail cost, $/Af[b]	$700	$500-650	$100-300	$250-350	$450-1,350
Typical retail price, $/AF	$450	$350-500	$0-300	$100-150	$350-1,250
Percent industrial and commercial	31%	31%	41%	48%	26%
No Action Alternative					
TAF average demand	175	864	925	701	5,817
TAF dry year demand	178	960	1,003	710	6,032
Typical retail cost, $/Af[b]	$806	$575-700	$125-325	$275-350	$500-1,450
Typical retail price, $/AF	$502	$400-600	$0-250	$125-175	$420-1,350
Percent industrial and commercial	31%	31%	41%	48%	26%
Average cost of supplies[c]	$523	$152	$115	$207	$702
TAF shortage during drought	28	251	12	47	1,511
Mandatory conservation during drought	10	54	12	33	571
Average loss per AF from mandatory conservation[d]	$549	$451	$192	$195	$523
TAF supplies developed during drought	18	195	0	14	940
Average cost of drought supplies, $/AF	$876	$904	NA	$140	$729

NOTES:

[a] Includes major industrial direct diversions of 10,000 AF/yr.
[b] Average cost for residential customers including service charges. Costs and prices for providers with only CVP water are typically higher.
[c] Average cost of supplies avoided or saved (Bay Area) to achieve supply/demand balance in No Action.
[d] Net revenue loss plus consumer surplus loss.

Table 4. Characteristics of M&I Provider Regions, Existing Conditions and No Action Alternative

No Action projects that may reduce M&I supplies or increase costs relative to existing conditions include the CVPIA. The CALFED No Action Alternative includes dedication of 800,000 AF of water for fish and wildlife, Level IV refuge water, restoration payments, and operation of the Shasta temperature control device. The dedicated water and Level IV refuge supplies will reduce CCWD water supplies relative to existing conditions. The CVPIA also will affect other providers located within the statutory Delta, including the City of Tracy, and potentially parts of Stockton and Sacramento.

o Action Alternative projects that are expected to increase supplies or reduce future costs, once completed, include the Los Vaqueros Reservoir Project. This project will improve the quality and reliability of CCWD M&I supplies.

Other Delta providers (not CCWD) are generally provided by larger water wholesalers, small districts, or individual wells. No specific actions have been identified that will affect them. However, these small providers normally have plans and programs in place that will affect their future water supplies.

Bay Region

Table 4 shows some characteristics of the Bay Region in the existing and No Action conditions. Current demand is about 707,000 AF. Retail cost to residential customers is currently about $500 to $650 per AF; and price, which does not include service charges, is $350 to $500 per AF. About one-third of demands are commercial and industrial.

Demand is expected to rise to 864,000 AF by 2020, with slightly higher demands in dry years due to less recharge of urban landscapes. The No Action Alternative cost and price are higher than for existing conditions because of conservation, CVPIA costs, and costs of new supplies. The region has a slight supply surplus in the average condition. The Bay Region has relatively unreliable supplies, so there is a substantial supply deficit in the dry condition.

This region is affected by any actions that affect the SWP or the CVP. No Action projects that may reduce M&I supplies or increase costs relative to existing conditions include the CVPIA. The CVPIA may reduce CVP supplies and increase costs, for reasons described above.

No Action Alternative projects that are expected to increase supplies or reduce future costs, once completed, also include the CVPIA. The CVPIA may increase SWP supplies, depending on the amount of dedicated water that can be exported from the Delta.

Sacramento River Region

Table 4 shows some characteristics of the Sacramento River Region in the existing and No Action conditions. Current demand is about 566,000 AF. Retail cost to residential customers is currently about $100 to $300 per AF; and variable price, which does not include service charges, is $0 to $300 per AF. This price is zero in some areas because some use is not metered or priced volumetrically. About 40 percent of demands are commercial and industrial.

Demand is expected to rise to 925,000 AF by 2020, with higher demands in dry years due to less recharge of urban landscapes. The No Action Alternative cost and price are higher than for existing conditions because of conservation and CVPIA costs.

No Action projects that may reduce M&I supplies or increase costs relative to existing conditions include:

- The CVPIA may reduce CVP supplies and increase costs, for reasons described above.
- Interim re-operation of Folsom Reservoir: This project could reduce M&I water supplies in the Sacramento area by dedicating more storage space to flood control.

San Joaquin Region

Table 4 shows some characteristics of the San Joaquin River Region group in the existing and No Action conditions. Current demand is about 337,000 AF. Retail cost to residential customers is currently about $250 to $350 per AF. Price, which does not include service charges, is $100 to $150 per AF. About half the demands are commercial and industrial.

Demand is expected to double to 701,000 AF by 2020, with higher demands in dry years due to less recharge of urban landscapes. The No Action Alternative cost and price are higher than for existing conditions because of conservation and CVPIA costs.

No Action projects that may reduce M&I supplies or increase costs relative to existing conditions include the CVPIA. The CVPIA may reduce CVP supplies and increase costs, for reasons described above.

No Action projects that are expected to increase supplies or reduce future costs, once completed, include:

- Monterey Agreement: This project revises the formula used to allocate SWP water, retires 45,000 AF of agricultural entitlement, transfers 130,000 AF of entitlement from agriculture to M&I, allows sale of the Kern Fan element of the Kern Water Bank to agricultural contractors, and changes allowable operations at Castaic Lake and Lake Perris.

- The CVPIA may increase SWP supplies, for reasons described above.

- New Melones Conveyance Project: This project conveys water to Stockton East Water District and Central San Joaquin Water Conservation District for use near and within Stockton.

SWP and CVP Service Areas Outside the Central Valley

Table 4 shows some characteristics of the Other SWP and CVP Service Areas Outside of the Central Valley in the existing and No Action conditions. For M&I economics this area does not include any areas served solely by the CVP. The San Felipe Division of the CVP is included in the Bay Region.

Current demand is about 3,784,000 AF in average years. Retail cost to residential customers is currently about $450 to $1,350 per AF. The higher price is representative of the Central Coast area only. Price, which does not include service charges, is about $350 to $1,250 per AF. About one-quarter of the demands are commercial and industrial.

2020 demand would rise to 5,817,000 AF in average years. Demands are higher in dry years due to less recharge of urban landscapes. Without new supplies the region is expected to have a substantial supply deficit in 2020, even in average years. The No Action Alternative cost and price are higher than for existing conditions because of conservation and costs of new supplies.

No Action projects that are expected to increase supplies or reduce future costs, once completed, include:

- The CVPIA may increase SWP supplies depending on the amount of dedicated water that can be exported out of the delta.

- Coastal Aqueduct: This project will provide SWP water for M&I use in San Luis Obispo and Santa Barbara counties.

- The Monterey Agreement will change SWP water allocations for M&I use, for the reasons described above.

- The Metropolitan Water District's Eastside Reservoir Project: This project will provide emergency storage following

earthquake, supplies during drought, and supplies to meet peak summer demands.

- Semitropic Water Storage District (WSD) Groundwater Banking Project: This project allows certain SWP entitlement holders to recharge and extract SWP water in the Semitropic WSD, and will reduce overdraft and increase operational flexibility.

UTILITIES AND PUBLIC SERVICES

The No Action Alternative represents the implementation of existing plans and programs in the absence of the CALFED Program.

This alternative would have potentially significant adverse impacts on utilities and public services. Mitigation measures for potentially significant adverse impacts are presented at the end of this section.

Delta Region

The 2020 level of development will result in an increase in population throughout the state, including the Delta Region. Population increases could require construction of additional power-generating facilities and additions or reconfiguration of the existing power distribution grid (such as transmission lines, substations). The projected population increase would likely require public services substantially exceeding the capacity of existing public service providers, resulting in a potentially significant adverse impact.

Development of water supply projects could have indirect effects on the Delta Region. The Delta is a hub for statewide water supply development. No Action Alternative water supply developments outside the Delta Region could necessitate development of in-Delta infrastructure (for example, greater water conveyance capacity). This could, in turn, require development of utility capacity and power distribution grids to accommodate greater pumping demands.

Presently, more power is used statewide to convey water than is generated by hydroelectric facilities. Water supply developments could have a positive or a negative effect on the current power-load deficit.

Bay Region

The effects of population growth discussed above for the Delta Region are applicable to the Bay Region.

Sacramento River Region

The effects of population growth discussed above for the Delta Region are applicable to the Sacramento River Region.

San Joaquin River Region

The potential effects of population growth and water supply development discussed for the Delta Region are relevant to the San Joaquin River Region. Additionally, the Kern Water Bank would increase the demand for pumping, in turn increasing the demand for power.

Land retirement from direct elimination or resulting from subsidies could have potentially significant impacts. Replacement by either urban or industrial development would likely increase power demands (in terms of electricity and infrastructure). New generating facilities and distribution infrastructure could be required. Conversion to recreational use could result in a greater demand for public services, possibly exceeding existing capacity.

SWP and CVP Service Areas Outside the Central Valley

The effects of population growth and water supply development discussed above for the Delta Region are likely to be applicable to these areas.

Furthermore, development of the coastal aqueduct could spur municipal and industrial

(M&I) development requiring construction of additional power generating facilities and other infrastructure.

Comparison of CALFED Alternatives to No Action Alternative

DELTA REGION

Table 5 provides a summary of the economic impact analysis for the Delta Region. CCWD was used as a proxy for water supply and quality analysis. It should be kept in mind that not all of CCWD is in the statutory Delta, and some
urban water users in the Delta are not served by CCWD. Water supply and water quality analysis were applied only to CCWD, but other comments, especially those with respect to CALFED actions, apply to all Delta providers. The operation of Los Vaqueros intake has resulted in revised operations at Contra Costa and pumping plant number one and resulting improved water quality in Rock Slough.

Impacts on utilities and public services vary only with respect to the proposed storage and conveyance components.

ALTERNATIVE 1

The nature and pattern of impacts on urban land use, M&I water supply economics, public utilities and services, and social well being that are discussed under Alternative 1 for the Ecosystem Restoration, Water Quality, Levee System Integrity, and Water Use Efficiency programs are the same for all alternatives unless specifically noted under the discussion for an alternative. Other differences exist between alternatives as described under "Water Storage and Conveyance."

Ecosystem Restoration Program

Urban Land Use

The Ecosystem Restoration Program Plan recommends land in the Delta region be converted would to habitat and ecosystem restoration, levee setbacks, and floodways. Specific potentially significant impacts on urban land use would depend on the actual location of the modifications and improvements. However, it is anticipated that this program would most likely affect agricultural uses and therefore would have only a negligible affect on urban land uses.

M&I Water Supply Economics

Ecosystem Restoration Program actions are expected to have small or no effects on M&I water supplies and costs unless environmental flows reduce M&I supplies or M&I providers pay some of the costs of restoration. Water flows for fish and wildlife could increase M&I water supply if the water could be reused as M&I water exports or if the flows contributed to Delta water quality standards. Prices of water transfers may be increased by transfers for environmental purposes.

Some restoration actions may benefit water quality in the Delta. Water quality improvements may occur through dilution caused by increased Delta inflow for restoration purposes, through reduced pollution loads caused by development and restoration of marsh and riparian habitats, and by increased immobilization of pollutants in these habitat types. Other water quality impacts could be negative; for example, habitat restoration may increase DOC loads in Delta water, which would increase DBP levels in treated waters.

Restoration may reduce the uncertainty of M&I water supplies by enhancing recovery of special-status species. Because M&I providers acquire water supplies to protect against

Economic Parameter	Level by Alternative (millions of dollars per year)[a]													
	Existing Conditions	No Action[b]	Alternative 1[b]			Alternative 2[b]				Alternative 3[b]				
			1A	1B	1C	2A	2B	2D	2E	3A	3B	3E	3H	3I
CALFED water supply costs[c]	0	0	No costs available											
Other water supply costs[c,d]	0	1.3	1.3	1.3	-3.2	0	-3.2	-1.4	-3.2	0	-3.9	-3.9	-3.9	-3.9
Total average costs[c]														
Drought conservation costs[e]	5	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Drought make-up supply costs[e]	0	15.4	15.4	15.4	8.4	15.4	8.4	11.9	8.4	13.2	4.1	4.1	4.1	4.1
Total drought costs[e]	5	21.1	21.1	21.1	14.1	21.1	14.1	17.6	14.1	18.9	9.8	9.8	9.8	9.8
Water quality costs[f]						S	S	S	S					
Water conservation costs														

NOTES:

CCWD impacts are used for water cost and water quality analysis.

[a] The lack of an entry does not mean that the impact is less than significant.

[b] Under the year 2020 development condition. Costs are additional costs to develop supplies or cost savings (-) from not needing available supplies.

[c] During a year of average delivery.

[d] Negative dollars in average years are cost savings from not needing available supplies.

[e] During a year of the critical period (1928 to 1934). Assumes supplies are allocated evenly over the period. Drought conservation costs include net revenue loss, consumer surplus loss and conservation program costs.

[f] See text. Significance calls relate only to differences in the configuration of Delta intake and conveyance facilities. An "S" denotes a probable benefit in some years.

Table 5. Summary of Impact Analysis for the Delta Region

uncertainty, water supply costs could be reduced.

Utilities and Public Services

Implementation of the Ecosystem Restoration Program could result in the following potential impacts on utilities and public services:

- Increased electricity requirements for water pumping;
- Relocation or modification of electrical transmission lines and substations;
- Relocation or modification of gas pipelines and water conveyance infrastructure;
- Additional public services required for new parks and refuges;
- Increases in recreational fishing stocks and waterfowl, possibly resulting in a greater number of fisher/hunter days per year, and an increase in the need for public services; and
- Negligible increase in local full-time employment of persons undertaking environmental monitoring, diversion and levee modification, and construction of infrastructure to create wetland and shallow-water habitat and other ecosystem elements such as riparian vegetation.

Although modifications to existing utilities may be required, these changes are not expected to require construction or development of additional utility capacity. It is expected that existing infrastructure could be reconfigured, and impacts are not expected to require public services in excess of current regional capacity.

Water Quality Program, Including Coordinated Watershed Management

Urban Land Use

The Water Quality Program focuses on source control and reducing the release of pollutants into the Bay-Delta system and its tributaries. The Water Quality Program is not anticipated to result in or direct or indirect land use impacts in the Delta or any of the other regions.

M&I Water Supply Economics

The Water Quality Program would result in benefits for M&I providers and their water customers, with some offsetting costs. M&I costs are the M&I cost shares of the water quality measures. Currently, the amount of these costs and the cost shares are undetermined.

Most benefits of the Water Quality Program would be in the form of avoided treatment and regulatory costs, and avoided end-user costs. Water treatment costs, or costs of mixing Delta water with other supplies, might be reduced. The amount of cost savings would depend substantially on state and federal drinking water standards, especially with respect to metals, disinfection by-products and microbes, and the changing costs and technology of water treatment. Lower salinity would reduce infrastructure damage costs, and net benefits (benefits minus costs) of conjunctive use and water reuse would be increased. End-users might avoid costs of purchased drinking water, tap water treatment, reduced life and value of water-using appliances, and adverse health effects. Currently, no monetary values have been estimated.

Utilities and Public Services

Implementation of the Water Quality Program could result in the following activities and consequences, all of which could affect utilities and public services:

- Relocation of water supply intakes and conveyance infrastructure;
- Upgrades to treatment processes, especially in treatment plants;
- Land conversion to avoid creation of salt drainage;
- Construction of Delta barriers;
- Upgrades to stormwater systems;
- Increase in state and federal agency activity, resulting in some new local employment to support regulatory and monitoring efforts, construction of field offices, and treatment facilities; and
- Installation of treatment facilities requiring unknown quantities of electricity and water conveyance infrastructure.

Increased demands on utility infrastructure and capacity are possible. The Water Quality Program is expected to benefit recreational use by reducing pollutant loadings (lower toxic levels for humans and wildlife, for example); however, any increase in the need for public services is unlikely to exceed existing capacity.

Levee System Integrity Program

Urban Land Use

The Levee System Integrity Program contains nine approaches, such as subsidence control and setback levees and associated habitat, to improve the integrity of the levee system. Improvements contemplated under the Levee System Integrity Program would involve acquiring new rights-of-way and constructing new setback levees. However, it is anticipated that this program would primarily affect agricultural land and therefore would have only a negligible affect on urban land uses.

M&I Water Supply Economics

The Levee System Integrity Program would result in a minor impact on Delta hydraulics and water quality. Very small impacts on water supply and quality and on associated costs are expected in normal conditions. In flood conditions or following an earthquake, improved levee integrity could affect M&I water quality through the effects of flooding on export operations and water quality. Benefits per event are probably most significant following an earthquake, because water quality is less of a concern, on average, during flood events. On average, flood control benefits would be limited by the small probability of levee failure event, and this probability would be affected by the Levee System Integrity Program. Some temporary adverse water quality effects of levee system improvements could be expected during the construction phase.

Utilities and Public Services

Implementation of the Levee System Integrity Program may require the displacement or modification of utility infrastructure, including electric transmission lines. Such effects could result from the modification and relocation of existing levees. The actions are not expected to affect major infrastructure components; therefore, significant impacts on utilities and public services are not anticipated.

Water Use Efficiency Program, Including Water Transfers

Urban Land Use

The Water Use Efficiency Program is not anticipated to have direct land use impacts. The program relies on incentives, technical assistance, and policies to be implemented by local agencies, rather than mandatory measures and targets for water use efficiency.

Indirect changes in land use may result in all five regions from the Water Use Efficiency Program. However, potential adverse impacts to developed land uses generally would be limited to changes in landscape materials, and would not be significant. Changes to the pace and location of urbanization would also be expected to be minimal and insignificant.

The water transfer program could have adverse impacts on urban land use and development. Both short- and long-term water transfers can result in growth that otherwise may not have a reliable long-term water supply. If transfers become unavailable in the future as a result of growth within the selling region and subsequent reduction in the transferable amount, growth within purchasing regions may be adversely impacted.

M&I Water Supply Economics

The Water Use Efficiency Program includes policies covering five areas: agricultural water use efficiency, urban water conservation, efficient use of environmental diversions, water recycling, and water transfers. Generally, the Water Use Efficiency Program is intended to help local agencies make informed decisions selecting the next least-costly increment of water supply to meet demand. Most actions in the Water Use Efficiency Program would be implemented by local agencies rather than CALFED. For M&I providers, the pace of implementation of urban conservation Best Management Practices (BMPs) would accelerate, and new practices would be added. Water reclamation (reuse) would be used to provide a larger share of supply, and policy measures to facilitate transfers would be developed.

The CALFED *Water Use Efficiency Input Report* 5-1 describes water conservation baseline levels and goals (CALFED 1997). Potential savings are described by region, but the Delta Region is not provided as a separate region.

Utilities and Public Services

Because the program is policy based and highly variable in outcome, effects to utilities and public services are difficult to foresee. However, given that actions are generally driven by incentives, and are extremely unlikely to require additional utility or public service capacity, impacts to utility infrastructure or public services would not be expected. Potential decreases in water usage would reduce

the amount of water conveyed, thus reducing the power demand. This would be a beneficial impact to utilities. However, increased levels of water recycling could result in increased treatment processes and greater energy requirements. In addition, distribution systems would be needed to provide recycled water to potential customers.

Storage and Conveyance

Urban Land Use

Under all the Alternative 1 and 2 configurations, conveyance components such as channel widening and island flooding could require relocating urban uses such as highways/roads, spot commercial uses, and scattered residences. Scattered residences are often on island perimeters adjacent to the levee to provide the residents access to the recreational benefits of the waterway. Adverse land use impacts resulting from these modifications would potentially be significant.

The specific locations of improvements contemplated for Alternatives 1, 2, and 3 have not been identified for this programmatic-level analysis. Thus, the consistency of project alternatives with general plan land use designations or zoning are not evaluated herein. However, inconsistency with these plans could result in a significant adverse land use impact.

M&I Water Supply Economics

Storage

Because Configuration 1A would include no substantial changes in conveyance, no water supply benefits are expected. The potential impacts of relocating Delta intake structures include minor water quality improvements and cost effects. Preliminary DWRSIM study results suggest using No Action Alternative deliveries for Configuration 1A as well. There may be a small water supply increase from Configuration 1A, but it has not yet been measured. Preliminary water quality results are also the same as those provided for the No Action condition.

Preliminary DWRSIM study results suggest using No Action Alternative deliveries for Alternative 1B as well, so there is no measured effect on water supply. Preliminary water quality results are also the same as those provided for the No Action condition.

DWR has provided preliminary analysis of TDS for Configuration 1C. The salinity analysis does not consider differences in the amount of storage and in the amount and timing of exports between alternatives. Rather, only differences in conveyance and intake configurations are modeled using DWR Run 472B hydrology. The average of 12 monthly 1976 to 1991 average TDS levels is 294 ppm, not significantly different from the 300 ppm for the No Action condition.

Economic analysis of changes in salinity caused by changes in Delta conveyance configuration was conducted. Configurations 1A and 1B have water supplies and salinity identical to No Action levels, so there is no impact. In Configuration 1C, the annual economic benefit is not significant, estimated to be less than $1.0 million annually.

Limited information on bromide and organic carbon concentrations are available. For estimates at Contra Costa Intake and at Los Vaqueros Intake, Configuration 1C shows slightly lower concentrations of bromide and nearly identical concentrations of DOC in comparison to Configuration 1A. Configuration 1A should be similar to No Action. Based on this limited information, changes in DBP precursors in 1A and 1C should not be economically significant.

Configuration 1C would build on Configuration 1B by enlarging some Delta channels and by adding up to 5 million acre-feet (MAF) of new water storage facilities.

The amount and pattern of impacts from Configuration 1C would depend on how the new facilities are managed and operated and how costs are allocated. Configuration 1C should have little effect on water supplies for most Delta M&I providers because most providers do not receive CVP or SWP supplies. Conveyance and storage impacts on Delta M&I providers involve construction and displacement effects, as well as water supply and water quality.

Preliminary DWRSIM modeling studies and assumptions involving the allocation of increased yield imply that CCWD would gain about 9,200 acre-feet in average years and 11,700 acre-feet in a year during the critical period. These gains would provide for about 5% and 6% of demand in the average and dry year, respectively. The average year supplies are worth about $6 million relative to the cost of other supplies, and critical period yield is larger than the average.

Utilities and Public Services

No storage facilities are proposed for Configurations 1A and 1B. However, Configuration 1C does include surface water storage and groundwater storage upstream of the Delta. Depending on the operation of these upstream storage facilities, impacts on utilities and public services in the Delta Region could result from alteration of existing flows or changes in current water temperature.

Configuration 1A includes no conveyance improvements. Configurations 1B and 1C both include conveyance modifications and improvements outside of the region, which could have indirect effects on this region.

Utilities associated with hydropower outputs or supplying energy for water conveyance could be affected by altered reservoir release patterns. Increasing storage volume could result in more hydropower; however, this could be counterbalanced by the greater power requirements associated with conveying larger flows.

At a statewide level, energy produced by hydropower falls short of what is needed, primarily for pumping, to convey flows. New storage facilities would affect both the amount of power supplied by hydroelectric facilities and the amount needed to convey water. Power-generating capacity changes could occur due to changes in reservoir volumes and flow regimes. Depending on how new storage facilities were designed and operated, the power deficit associated with conveyance could be reduced or enlarged. A sufficient deficit could require additional power-generating capacity, resulting in significant impacts.

Additional information is needed to determine whether power demands for conveyance outside the region would be greater or smaller and whether new capacity would be required. Such information would include knowledge of the exact storage configuration chosen for development, the site of new facilities, and operating procedures.

Operating pumps at full capacity is likely to require additional electrical power. Smaller fisheries impacts could boost recreational activities, which could in turn require additional public services. Neither of these outcomes are expected to require additional utility infrastructure or public services in excess of existing capacity.

ALTERNATIVE 2

Alternative 2 would utilize a modified system of through-Delta conveyance. Four variations are made up of four conveyance and three storage options. All variations include the ERP, water quality, water use efficiency and levee system integrity programs, all slightly modified to complement Alternative 2. Precise locations for many actions are not currently known.

Ecosystem Restoration, Water Quality, Levee System Integrity, Coordinated Watershed Management, and Water Use Efficiency Programs

Urban Land Use

Potential impacts on land uses in the Delta under these programs are anticipated to be similar to those described under Alternative 1.

M&I Water Supply Economics

The nature and pattern of impacts are as described for Alternative 1, except with respect to water transfers. There would be substantial in-Delta water conveyance capacity increases under Alternative 2. M&I water supply economics would be affected primarily through changes to water supply and water costs. Potential adverse effects at the area of origin are not related to municipal water supply economics. However, because transfers can

invoke both beneficial and adverse impacts, at times on the same resource, the net environmental effect of a water transfer within and between resources must be considered when determining a transfer's overall effect on the environment.

Potentially significant beneficial environmental and economic impacts are associated with the transferred water's destination. The economic value of an increased water supply is that there is potential for reduced water supply costs, increased protection against emergencies because of greater water delivery flexibility and dependability, less uncertainty with overall water supplies, and improved water quality.

There is also potential for environmental benefits at the destination. Transfers reduce the need for other water supplies, so the environmental impacts associated with use and development of the other supplies are avoided.

Utilities and Public Services

Impacts to utilities and public services are expected to be similar to those discussed for Alternative 1.

Storage and Conveyance

Urban Land Use

Potential impacts on urban land uses in the Delta under Alternative 2 are anticipated to be similar to those described under Alternative 1.

M&I Water Supply Economics

Preliminary DWRSIM modeling studies for Configuration 2A and assumptions involving yield allocation imply that CCWD would gain about 2,500 acre-feet in average years and 1,300 acre-feet in a year during the critical period. These gains would provide for about 1.4 % and 0.7 % of demand in the average and dry year, respectively. The average year supplies are worth about $2 million annually, but critical period yield is less than the average.

DWR has provided a preliminary analysis of TDS for Configurations 2A, 2D and 2E. The salinity analysis does not consider differences in the amount of storage and in the amount and timing of exports between alternatives. Rather, only differences in conveyance and intake configurations are modeled using DWR Run 472B hydrology. The average of 12 monthly 1976 to 1991 average TDS levels for Configuration 2A at Rock Slough is 166 ppm, almost half of the 300 ppm for the No Action condition.

For Configuration 2D, the average of 12 monthly 1976 to 1991 average TDS levels is 168 ppm, almost half of the 300 ppm for the No Action condition. For Configuration 2E, the average is 161 ppm.

Economic analysis of changes in CCWD salinity caused by changes in Delta conveyance configuration was conducted. Configurations 2A through 2E show salinity levels of 161 to 168 ppm as compared to the No Action condition of 300 ppm. Annual economic benefits are $13 to $14 million.

Limited information on bromide and organic carbon concentrations are available. For estimates at the Contra Costa intake and at Los Vaqueros intake, Configurations 2B, 2D and 2E show substantially lower concentrations of bromide than 1A. DOC concentrations, however, are slightly higher in Configurations 2B and 2D and slightly lower in 2E. Configuration 1A should be similar to No Action. Based on this limited information, reductions in bromides in Alternative 2 are significant. The economic consequences of this benefit cannot be estimated at this time.

Preliminary DWRSIM results and water supply benefits for Configuration 2B are the same as those discussed for Configuration 1C. Preliminary water quality benefits are the same as those discussed for Configuration 2A.

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 2D imply that CCWD would gain about 5,300 acre-feet in average years and 6,100 acre-feet in a year during the critical period. These gains would provide for about 3.0 and 3.4 % of demand in the average and dry year, respectively. The average year supplies are worth about $4 million annually. Critical period yield is about the same as the average.

Utilities and Public Services

Implementing Configurations 2A and 2B could impact some minor infrastructure, depending on how improvements would be constructed. Minor electric transmission lines could be displaced by river widening or improving through-Delta channels. Impacts to major infrastructure would not be expected. Significant impacts are not likely.

Implementing Configuration 2D could affect existing infrastructure. Floodways, setback levees, intake structures, and removal of a portion of the Bouldin Island levee could displace infrastructure. Power transmission lines may need to be relocated, depending on how new developments would be constructed. Relocation of major transmission lines would be a potential significant impact.

Implementing Configuration 2E could involve constructing setback levees, developing interties and intake structures, and flooding areas to create habitat. Infrastructure is likely to be affected. Other potential infrastructure impacts are likely to be similar to those described for Configuration 2D.

ALTERNATIVE 3

This configuration would utilize through-Delta modifications and an isolated system for through-Delta conveyance for exported supplies. Combinations of seven potential conveyance configurations and two new storage configurations result in nine variations. Precise locations for many actions are not currently known.

Ecosystem Restoration, Water Quality, Levee System Integrity, Coordinated Watershed Management, and Water Use Efficiency Programs

Urban Land Use

Potential impacts on urban land uses in the Delta under Alternative 3 are anticipated to be similar to those described for Alternative 1.

M&I Water Supply Economics

The nature and pattern of impacts are as described for Alternative 2 except that water transfer economic and environmental benefits at the destination might be increased.

Utilities and Public Services

Potential impacts to utilities and public services are expected to be similar to those described for Alternative 1.

Storage and Conveyance

Urban Land Use

Potential land use impacts in the Delta under Alternative 3 are anticipated to be similar to those described under Alternative 1. The main differences between Alternatives 1 and 3 involve the storage and conveyance components.

Land use impacts of developing new on- or off-stream storage could be significant if this action leads to displacement of residents or division or disruption of an established community. Additionally, short-term construction-related disruption to established urban land uses could result in a significant impact. Impacts could include increased noise, dust and truck traffic, disruption of utility service, and possible street closures. During the operational phase of the program, impacts could result from relocation of roads and utility lines. All construction and operational impacts would be considered potentially significant and mitigable. Operation of storage facilities could result in the beneficial impact of reduced flood potential in some locations.

Potential direct land use impacts under Alternative 3 would be different for an open channel versus a buried pipeline. Creation of an open channel isolated conveyance would lead to a significant adverse land use impact by permanently converting underlying land uses to open space. Construction of a buried pipeline isolated conveyance, however, would create a short-term, temporary adverse impact on surrounding land uses. Any urban land uses affected could resume after completion of pipeline construction. Potential impacts for all

configurations under Alternative 3 include displacing residences and disrupting or dividing an established community.

M&I Water Supply Economics

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 3A imply that CCWD would gain about 4,500 acre-feet in average years and 3,500 acre-feet in a year during the critical period. These gains would provide for about 1.4% and 2.0% of demand in the average and dry year, respectively. The average year supplies are worth about $3 million, but critical period yield is less than the average.

DWR has provided a preliminary analysis of TDS for Configurations 3A, 3B and 3E. Only differences in salinity due to different conveyance and intake configurations are modeled using DWR run 472B hydrology. The average of 12 monthly 1976 to 1991 average TDS levels for Configuration 3A is 317, not significantly more than the No Action level of 300.

For Configuration 3B, the average of 12 monthly 1976 to 1991 average TDS levels is 376, substantially more than the No Action level of 300. For Configuration 3E, the average of 12 monthly 1976 to 1991 average TDS levels is 294 ppm, not significantly different from the 300 ppm for the No Action condition.

Economic analysis of changes in salinity caused by changes in Delta conveyance configuration was conducted. Salinity in Configuration 3A is similar to but slightly more than No Action levels. Net economic costs are $2 million annually. In 3B, salinity is increased from 300 to 376 ppm, for a net economic cost of $8 million annually. In Configuration 3E, salinity is nearly identical to No Action levels, for a small net benefit of less than $1 million. The increase in salinity in Configuration 3B is considered a potentially significant adverse effect.

Limited information on bromide and organic carbon concentrations are available. For estimates at the Contra Costa intake and at Los Vaqueros intake, Configuration 3E shows somewhat lower concentrations of bromide than 1A, but DOC concentrations are somewhat higher than in Configuration 1A. Configuration 1A should be similar to No Action. Based on this limited information, bromide concentrations would be reduced somewhat, but DOC concentrations increased somewhat. No economic benefit or cost estimates are possible at this time.

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 3B imply that CCWD would gain about 10,800 acre-feet in average years and 17,600 acre-feet in a year during the critical period. These gains would provide for about 6.2 % and 9.9 % of demand in the average and dry year, respectively. The average year supplies are worth about $8 million, and critical period yield is larger than the average.

No additional effects on M&I water use and costs are expected for Configurations 3E, 3H, or 3I in comparison to Configuration 3B.

Utilities and Public Services

Possible direct effects (Configurations 3B, 3E, and 3I) could include displacement and relocation of power lines. Major transmission lines, gas fields, and storage areas are not likely to be affected.

While public services would likely be affected by Alternative 3 development, demand likely would be within existing capacity. Minor effects in terms of economic growth stimulation or downward pressure are also possible. For additional details on both of these subjects, see discussion for Alternative 2.

Conveyance components for Configurations 3A and 3B are the same as those proposed for Configurations 2A and 2B, with the exception of the isolated facilities/intakes and open channel proposed in Alternative 3. Hence, impacts to infrastructure are expected to be similar to those for Configurations 2A and 2B.

The additional impacts associated with the open-channel isolated facility include the crossing of minor infrastructure, including power lines and gas pipelines.

Implementing Configuration 3H would have effects similar to those described for Configuration 2D.

Under Configuration 3I, power lines would be intersected by proposed conveyance channels. This would be considered a potentially significant adverse impact.

BAY REGION

The general description of the alternatives variations provided for the Delta Region also is valid for the Bay Region. Impacts on urban resources in the Bay Region are generally similar to those described for each alternative in the Delta Region, except as discussed below. Table 6 provides a summary of the M&I water supply impact analysis for the Bay Region.

ALTERNATIVE 1

Ecosystem Restoration, Water Quality, Levee System Integrity, Coordinated Watershed Management, and Water Use Efficiency Programs

Urban Land Use

No Program alternatives are anticipated to have significant direct or indirect effects on urban land uses in the Bay Region.

County general plans in the Bay Region which could be applicable to land use impacts of the CALFED alternatives include those of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, and Sonoma counties. Principal local plans include those of the cities of Berkeley, Oakland, San Francisco, and San Jose. The compatibility and consistency of potential CALFED actions with these plans is not evaluated in this programmatic-level analysis. However, all program elements will be designed to be consistent with all applicable plans.

M&I Water Supply Economics

The nature and pattern of impacts for the Ecosystem Restoration Program are as described for the Delta Region, Alternative 1. Any water quality changes would affect the Bay Region through SWP and CVP exports.

The nature and pattern of impacts associated with the Water Quality Program are similar to those described for the Delta Region, Alternative 1, but the Water Quality Program includes only two actions. Water quality in the Bay Region could be affected by the quality of SWP and CVP exports as discussed below.

The nature and pattern of impacts associated with the Water Use Efficiency Program, Including Water Transfers, are as described for the Delta Region, Alternative 1. Because the Bay Region generally has a high level of conservation, additional costs of conservation per unit of water saved may be higher than average. Efficiency Input Report 5-1 describes preliminary water conservation No Action Alternative levels and goals (CALFED 1997). Potential real water savings from M&I uses due to CALFED Water Use Efficiency Actions for UR-4 (the San Francisco Bay Area) are estimated to be 135 to 150 TAF. The costs and benefits of this conservation have not been counted.

The CALFED water transfer program will influence only a small fraction of Central Valley and Delta flows in Alternative 1.

Storage and Conveyance

M&I Water Supply Economics

Preliminary DWRSIM modeling studies and yield allocation assumptions imply that the Bay Region would gain about 21,000 AF in average years and 26,900 AF in a year during the critical period. These gains would provide for about 2.4 percent and 2.8 percent of demand in the average and dry year, respectively. The average year supplies are worth $15 million annually in comparison to the costs of other supplies, and critical period yield is larger than the average.

Economic Parameter	Level by Alternative (millions of dollars per year)													
	Existing Conditions	No Action	Alternative 1			Alternative 2				Alternative 3				
			0	1B	1C	2A	2B	2D	2E	3A	3B	3E	3H	3I
CALFED water supply costs	0	0	No costs available											
Other water supply costs	-14.0	-8.4	-8.4	-8.4	-15.0	-10.6	-15.0	-12.3	-15.0	-11.7	-16.1	-16.1	-16.1	-16.1
Total average costs														
Drought conservation costs	42.6	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3
Drought make-up supply costs	0	176.6	176.6	176.6	156.9	177.1	156.9	166.9	156.9	173.1	143.5	143.5	143.5	143.5
Total drought costs	42.6	202.9	202.9	202.9	183.2	203.4	183.2	193.2	183.2	199.4	169.8	169.8	169.8	169.8
Water quality costs						S	S	S	S			B		
Water conservation costs														

NOTE:
See notes from Table5 .

Table 6. Summary of Impact Analysis for the Bay Region (CCWD not included)

Because Configuration 1A would include no additional storage or conveyance, no substantial water supply benefits are expected. Configuration 1B would include South Delta modifications to allow export pumps to operate at their physical capacity. For Configurations 1A and 1B, preliminary DWRSIM results suggest there will be no substantial change in water supply and water supply economics, and preliminary water quality analysis is the same as for the No Action condition.

DWR has provided preliminary analysis of TDS for Configuration 1C. The salinity analysis does not consider differences in the amount of storage and in the amount and timing of exports between alternatives. Rather, only differences in conveyance and intake configurations are modeled using DWR Run 472B hydrology. Results, in terms of average salinity of exports from Clifton Court, are provided in Table 3.

Economic analysis of changes in salinity caused by changes in delta conveyance configuration was conducted. Configurations 1A and 1B have water supplies and salinity identical to No Action levels, so there is no impact. In Configuration 1C, the average TDS of delivered water is increased slightly from 240 to 244 ppm for an annual economic cost of $2 million.

Limited information on bromide and organic carbon concentrations are available. The South Bay obtains water from SWP and CVP south delta exports. For estimates "at Clifton Ct" and "at Tracy PP" Configuration 1C shows slightly lower concentrations of bromide but slightly higher concentrations of DOC than 1A. Configuration 1A should be similar to No Action.

At the North Bay Aqueduct "at NBA intake," concentrations of bromides and DOC are about the same in Configuration 1C as compared to Configuration 1A.

Based on this limited information, changes in DBP precursors in Configurations 1A and 1C should not be economically significant.

ALTERNATIVE 2

Ecosystem Restoration, Water Quality, Levee System Integrity, Coordinated Watershed Management, and Water Use Efficiency Programs

Urban Land Use

Potential impacts on urban land uses under the programs listed above are anticipated to be similar to those described for Alternative 1.

M&I Water Supply Economics

The nature and pattern of impacts are as described for Alternative 1 except that environmental and economic benefits of the water transfer program might be increased.

Storage and Conveyance

Urban Land Use/Utilities and Public Services

Under Alternative 2, improved accessibility to larger and more secure water supplies could induce additional urban growth, community development, and related resources. Municipal, industrial, and agricultural enterprises could be stimulated, depending on how conveyance and storage facilities were developed outside the region. This could, in turn, create a need for additional utility infrastructure, including power generation capacity; or require displacement, modification, or relocation of existing infrastructure. The demand for public services could increase due to better quality or quantity of recreational resources.

M&I Water Supply Economics

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 2A imply that the Bay Region would gain about 6,800 acre-feet in average years and 3,000 acre-feet in a year during the critical period. These gains would provide for about 0.8% of demand in average and 0.3% in dry years. The average year supplies are worth about $5 million annually, but critical period yield is less than the average.

DWR has provided a preliminary analysis of TDS for Configurations 2A, 2D, and 2E. The salinity analysis does not consider differences in the amount of storage and in the amount and timing of exports between alternatives. Rather, only differences in conveyance and intake configurations are modeled using DWR Run 472B hydrology. Results, in terms of average salinity of exports from Clifton Court Forebay, are summarized in Table 8.2.3-4.

Configurations 2A, 2D and 2E all have lower TDS levels than No Action, both in source water and end user supplies. Economic analysis of changes in Bay Region salinity caused by changes in Delta conveyance configuration was conducted. Configurations 2A through 2E show end-user salinity levels of 212 to 213 ppm, as compared to the No Action condition of 240 ppm. Annual economic benefits are $11 to $12 million.

Limited information on bromide and organic carbon concentrations are available. The South Bay obtains water from SWP and CVP diversions in the south Delta. For estimates "at Tracy PP" and "at Clifton Ct," Configurations 2B, 2D and 2E show slightly lower concentrations of bromide and DOC than 1A. DOC estimates are slightly higher or the same. Configuration 1A should be similar to No Action. Based on this limited information, reductions or increases in DBP precursors in Alternative 2 do not appear to be economically significant.

At the North Bay Aqueduct "at NBA intake," concentrations of bromides and DOC are both increased slightly in Alternative 2. This may be an adverse effect, but no economic analysis is available.

Preliminary DWRSIM results and water supply benefits are the same for Configuration 2B as those discussed for Configuration 1C.

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 2D imply that the Bay Region would gain about 12,100 acre-feet in average years and 13,900 acre-feet in a year during the critical period. These gains would provide for about 1.4% of

demand in the average and dry year. The average year supplies are worth about $8 million annually, and critical period yield is more than the average.

Preliminary DWRSIM results and water supply benefits are the same for Configuration 2E as those discussed for Configuration 1C.

ALTERNATIVE 3

Ecosystem Restoration, Water Quality, Levee System Integrity, Coordinated Watershed Management, and Water Use Efficiency Programs

Urban Land Use

Potential impacts on urban land uses under the programs listed above are anticipated to be similar to those described for Alternative 1.

M&I Water Supply Economics

The nature and pattern of impacts on M&I water supply economics under the programs listed above are as described for Alternative 2 except that water transfer economic and environmental benefits at the destination might be increased.

Storage and Conveyance

M&I Water Supply Economics

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 3A imply that the Bay Region would gain about 10,200 acre-feet per year in average years and 7,900 acre-feet per year in a year during the critical period. These gains would provide for about 1% of demand in the average and dry year. The average year supplies are worth roughly $7 million annually, but critical period yield is less than the average.

A preliminary analysis of salinity of water exported from Clifton Court Forebay is summarized in Table 8.2.3-4 for Configurations 3A, 3B, and 3E. In Configuration 3E, the concentration of TDS in water exported from Clifton Court Forebay would be reduced by over one half relative to the No Action Alternative.

Economic analysis of changes in salinity caused by changes in Delta conveyance configuration was conducted. Salinity of Configuration 3A end-user water deliveries is less saline (217 ppm) than No Action (240 ppm). Net economic benefits are $10 million annually. In 3B, salinity is reduced to 214 ppm for a net economic benefit of $11 million annually. In Configuration 3E, salinity is reduced to 195 ppm for a net benefit of $19 million in comparison to No Action.

Limited information on bromide and organic carbon concentrations are available. The South Bay obtains water from SWP and CVP diversions in the south Delta. For estimates "at Tracy PP" and "at Clifton Ct," Configuration 3E shows much lower concentrations of bromide and substantially lower concentrations of DOC than 1A. Configuration 1A should be similar to No Action. Based on this limited information, reductions in DBP precursors in the South Bay region in Alternative 3 appear to be economically significant.

At the North Bay Aqueduct "at NBA intake," concentrations of bromides and DOC are both increased in Alternative 3. This could be an adverse effect, but no economic analysis is available.

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 3B imply that the Bay Region would gain about 24,900 acre-feet per year in average years and 40,300 acre-feet per year during the critical period. These gains would provide for about 2.9% and 4.2% of demand in the average and dry year, respectively. The average year supplies are worth about $17 million annually, and critical period yield is more than the average.

No additional effects on M&I water use and costs are expected for Configuration 3E in comparison to Configuration 3B.

SACRAMENTO RIVER REGION

The Impact analysis for the Sacramento River region is summarized in Table 7.

Economic Parameter	Level by Alternative (millions of dollars per year)													
	Existing Conditions	No Action	Alternative 1			Alternative 2				Alternative 3				
			0	1B	1C	2A	2B	2D	2E	3A	3B	3E	3H	3I
CALFED water supply costs	0	0	No costs available											
Other water supply costs	0	0.1	0.1	0.1	-1.2	0	-1.2	-0.9	-1.2	0	-1.4	-1.4	-1.4	-1.4
Total average costs														
Drought conservation costs	0	2.6	2.6	2.6	2.0	2.6	2.0	2.5	2.0	2.3	1.4	1.4	1.4	1.4
Drought make-up supply costs	1.9	0	0	0	0	0	0	0	0	0	0	0	0	0
Total drought costs	1.9	2.6	2.6	2.6	2.0	2.6	2.0	2.5	2.0	2..3	1.4	1.4	1.4	1.4
Water quality costs														
Water conservation costs														

NOTE:

See notes from Table 5.

Table 7. Summary of Impact Analysis for the Sacramento River Region

ALTERNATIVE 1

Ecosystem Restoration, Water Quality, Levee System Integrity, Coordinated Watershed Management, and Water Use Efficiency Programs

Urban Land Use

County general plans in the Sacramento River Region which could be applicable to land use impacts of the CALFED alternatives include those of: Butte, Colusa, Glenn, Lake, Lassen, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Solano, Sutter, Tehama, Yolo, and Yuba counties. Principal local plans include those of the cities of Chico, Sacramento, Redding, and Davis. The compatibility and consistency of potential CALFED actions with these plans is not evaluated in this programmatic-level analysis. However, inconsistency between applicable Alternative 1 program elements with these plans could result in a significant adverse land use impact.

County general plans in the San Joaquin River Region which could be applicable to land use impacts of the CALFED alternatives include those of Amador, Calaveras, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin, Stanislaus, Tuolumne, and Tulare counties. Principal local plans include those of the cities of Fresno, Bakersfield, Stockton, and Modesto. The compatibility and consistency of potential CALFED actions with these plans is not evaluated in this programmatic-level analysis. However, all program elements will be designed to be consistent with all applicable plans.

Land owned by the Bureau of Indian Affairs in the San Joaquin River Region is located east of Lake Success in central Tulare County. This land would not be impacted by the project alternatives.

Potential watershed activities in the Sacramento River Region will be compatible with applicable

environmental and land use plans and policies in their affected jurisdiction. Watershed activities may also have short-term land use impacts due to temporary construction. Disruption to local developed land uses could include temporary increased noise from operating excavation equipment, dust from earthwork, increased truck traffic on local streets, and potential utility disruptions.

In the long run, potential vegetation and habitat restoration activities, channel improvements, and erosion control practices would improve those parts of the affected upper watershed areas in the Sacramento River Region designated for habitat restoration. These types of activities would have only localized land use impacts and would likely not be incompatible with nearby land uses.

M&I Water Supply Economics

The Ecosystem Restoration Program have no effect on M&I water economics in the Sacramento River Region, except as CVP water service contract supply amounts may be affected. Also, upper watershed management could affect the region.

The Water Quality Program is the same as described for the Delta Region, Alternative 1, except that Actions 5, 6, and 7 are not included. Major mines in the Sacramento River Basin include Iron Mountain Mine, Afterthought Mine, Cherokee Mine, and Manzanita Mine. The Water Quality Program would not affect the Sacramento River Region, except as CVP water service contract supply amounts may be affected.

The nature and pattern of impacts associated with the Water Use Efficiency Program, Including Water Transfers are as described for the Delta Region, Alternative 1. Because the Sacramento River Region generally has a low level of conservation in the existing condition, additional costs of conservation per unit of water saved may be lower than average. The CALFED Water Use Efficiency Input Report describes preliminary water conservation baseline levels and goals. Potential real water savings from M&I uses due to CALFED Water Use Efficiency Actions for UR-1, the Sacramento River Area, are estimated to be 5 to 10 TAF.

The CALFED water transfer program would have very little or no effect on water supply economics in the Sacramento Region.

Utilities and Public Services

The nature and pattern of impacts on utilities and public services would be the same as discussed for the Delta Region.

Storage and Conveyance

Urban Land Use

Potentially significant impacts are not anticipated on urban land use for storage and conveyance facilities associated with Configuration 1C. The likely location of large storage facilities is in foothill or mountain areas, where land use is likely to be agricultural or open space. Program actions could result in potentially significant impacts if the locations of facilities displaced residents, physically disrupted or divided an established community, or were inconsistent with a local or regional plan.

M&I Water Supply Economics

Because Configuration 1A would include no additional storage or conveyance, no substantial water supply benefits are expected. Configuration 1B would include South Delta modifications to allow export pumps to operate at their physical capacity. For Configurations 1A and 1B, preliminary DWRSIM results suggest there will be no substantial change in water supply and water supply economics. There is also no effect on water quality since this region is upstream of the Delta.

Preliminary DWRSIM modeling studies and yield allocation assumptions imply that the Sacramento River Region would gain about 6,200 AF in average years and 7,900 AF in a year during the critical period. These gains would provide for about 0.7 percent of demand in average and 0.8 percent of demand in dry years. The average year supplies are worth roughly $2 million annually, but critical period yield is less than the average.

Utilities and Public Services

The potential impacts associated with the development of groundwater storage include increased energy consumption for pumping and relocation of minor infrastructure.

For additional upstream surface storage, several types of actions on the Sacramento River tributaries are under consideration: raising existing dams to increase capacity of existing reservoirs, and developing off-stream or new on-stream storage.

Surface storage projects under consideration could have a range of significant impacts to existing utilities and public services. The majority of impacts would be related to hydropower output modifications, storage facility construction phases, and the potential stimulation of M&I development.

Greater storage could also facilitate habitat rehabilitation and perhaps recreation by increasing the availability of flows necessary to develop these activities. Although the demand for public services is likely to increase under such circumstances, it is not likely to exceed existing capacity.

During construction of storage facilities, infrastructure could be displaced. New structures could require relocating or modifying transmission lines and other major infrastructure, resulting in potential significant adverse impacts.

Development of M&I facilities, because of opportunities created through water-related facilities, is possible but uncertain at the programmatic level. The potential effects of development include increased demand for utilities and public services.

ALTERNATIVE 2

Ecosystem Restoration, Water Quality, Levee System Integrity, Coordinated Watershed Management, and Water Use Efficiency Programs

Urban Land Use

The nature and pattern of impacts are as described for Alternative 1.

M&I Water Supply Economics

The nature and pattern of impacts are as described for Alternative 1.

Storage and Conveyance

Urban Land Use

Impacts are the same as described for Alternative 1.

M&I Water Supply Economics

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 2A imply that the Sacramento River Region would gain about 2,000 acre-feet per year in average years and 900 acre-feet per year in a year during the critical period. These gains would provide for less than 0.1% of demand in the average and dry year. Some additional supplies, worth less than $1 million annually.

Preliminary DWRSIM results and water supply benefits are the same for Configuration 2B as those discussed for Configuration 1C.

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 2D imply that the Sacramento River Region would gain about 3,600 acre-feet per year in average years and 4,100 acre-feet per year during the critical period. These gains would provide for less than 0.5% of demand in the average and dry year. The average year supplies are worth roughly $1 million annually, but critical period yield is more than the average.

Preliminary DWRSIM results and water supply benefits are the same as those discussed for Configuration 1C.

Utilities and Public Services

No new storage is proposed for Configuration 2A. Configuration 2D includes off-aqueduct surface water storage.

Configurations 2B and 2E include surface water storage on Sacramento River tributaries, groundwater storage in the Sacramento Valley, and off-aqueduct surface water storage.

Direct effects would result from developing storage in the region, and indirect effects would be associated with developing more surface storage in the state. Both types of impacts would be similar to those described for Configuration 1C.

ALTERNATIVE 3

Ecosystem Restoration, Water Quality, Levee System Integrity, and Water Use Efficiency Programs

Urban Land Use

The nature and pattern of impacts are as described for Alternative 1.

M&I Water Supply Economics

The nature and pattern of impacts are as described for Alternative 1.

Utilities and Public Services

The nature and pattern of impacts are as described for Alternative 1.

Storage and Conveyance

Urban Land Use

The nature and pattern of impacts are as described for Alternative 1.

M&I Water Supply Economics

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 3A imply that the Sacramento River Region would gain about 3,000 acre-feet per year in average years and 2,300 acre-feet per year during the critical period. These gains would provide for less than 0.5% of demands. The average year supplies are worth about $1 million annually, and critical period yield is less than the average.

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 3B imply that the Sacramento River Region would gain about 7,300 acre-feet per year in average years and 11,900 acre-feet per year during the critical period. These gains would provide for about 1.0 and 1.2% of demand in the average and dry year, respectively. The average year supplies are worth roughly $3 million annually, and critical period yield is larger than the average.

No additional effects on M&I water use and costs are expected for Configurations 3E, 3H, or 3I in comparison to Configuration 3B.

Utilities and Public Services

No new storage is proposed for Configuration 3A. The remaining configurations include surface water storage on Sacramento River tributaries, groundwater storage in the Sacramento Valley, and off-aqueduct surface water storage.

Indirect impacts would result from developing more surface storage in the state, and direct effects would be associated with developing storage in the region. Both types of impacts, relevant to all configurations except Configuration 3A, would be similar to those discussed for Configuration 1C.

No conveyance facilities are proposed for the Sacramento River Region. However, indirect effects from conveyance infrastructure modifications and improvements outside the region are possible for all configurations except 1A. These effects would be similar to those discussed for Configuration 1C for the Delta Region.

SAN JOAQUIN RIVER REGION

Table 8 provides a summary impacts on M&I water supply economics for the San Joaquin River Region.

ALTERNATIVE 1

Ecosystem Restoration, Water Quality, Levee System Integrity, Coordinated Watershed Management, and Water Use Efficiency Programs

Urban Land Use

The general descriptions of Alternatives 1, 2, and 3 and the features of each alternative provided for the Sacramento River Region are valid for the San Joaquin River Region.

M&I Water Supply Economics

The nature and pattern of impacts associated with the Ecosystem Restoration Program are as described for the Delta Region, Alternative 1. Any water quality improvements would affect the San Joaquin River Region through SWP and CVP exports.

The nature and pattern of impacts associated with the Water Quality Program are as described for the Delta Region, Alternative 1.

Any water quality improvements would affect the San Joaquin River Region through SWP and CVP exports.

The nature and pattern of impacts associated with the Water Use Efficiency Program, Including Water Transfers are as described for the Delta Region, Alternative 1. Because the San Joaquin River Region generally has a lower than average level of conservation in the existing condition, additional costs of conservation per unit of water saved may be lower than average. CALFED Water Use Efficiency Input Report describes preliminary water conservation baseline levels and goals. No economic analysis of benefits or costs associated with this conservation is available.

The CALFED water transfer program will have impacts similar to the Bay Region.

Utilities and Public Services

The nature and pattern of impacts are as described for Alternative 1, Delta Region.

	Level by Alternative (millions of dollars per year)													
			Alternative 1			Alternative 2				Alternative 3				
Economic Parameter	Existing Conditions	No Action	1A	1B	1C	2A	2B	2D	2E	3A	3B	3E	3H	3I
CALFED water supply costs	0	0	No costs available											
Other water supply costs	0	-1.7	-1.7	-1.7	-3.4	-2.2	-3.4	-2.6	-3.4	-2.5	-3.7	-3.7	-3.7	-3.7
Total average costs														
Drought conservation costs	0	7.0	7.0	7.0	6.6	7.0	6.6	6.8	6.6	7.0	6.4	6.4	6.4	6.4
Drought make-up supply costs	8.5	2.1	2.1	2.1	1.4	2.1	1.4	1.7	1.4	1.9	1.0	1.0	1.0	1.0
Total drought costs	8.5	9.1	9.1	9.1	8.0	9.1	8.0	8.5	8.0	8.9	7.4	7.4	7.4	7.4
Water quality costs						S	S	S	S			B		
Water conservation costs														

NOTE:
See notes from Table 5.

Table 8. Summary of Impact Analysis for the San Joaquin River Region

Storage and Conveyance

M&I Water Supply Economics

The general description of Alternative 1 and the features of the each sub-alternative provided for the Delta Region is valid for the San Joaquin River Region as well.

Because Configuration 1A would include no additional storage or conveyance, no substantial water supply benefits are expected. Configuration 1B would include South Delta modifications to allow export pumps to operate at their physical capacity. For Configurations 1A and 1B, preliminary DWRSIM results suggest that there will be no substantial change in water supply.

Economic analysis of changes in salinity caused by changes in delta conveyance configuration was conducted. Configurations 1A and 1B have water supplies and salinity identical to No Action levels, so there is no impact. In Configuration 1C, the average TDS of delivered water is increased from 315 to 325 for an annual economic cost of less than $1 million.

Limited information on bromide and organic carbon concentrations are available. For estimates "at Tracy PP" Configuration 1C shows slightly lower or the same concentrations of bromide and slightly higher concentrations of DOC than 1A. Configuration 1A should be similar to No Action. Based on this limited information, reductions in DBP precursors in 1A and 1C should not be economically significant.

Configuration 1C would build on Configuration 1B by enlarging Delta channels and by adding new water storage facilities. Up to 5 MAF of storage would be added. Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 1C imply that the San Joaquin River Region

would gain about 9,400 AF in average years and 12,100 AF in a year during the critical period. These gains would provide for about 1.3 percent of demand in average years, and 1.7 percent of demand in dry years. The average year supplies are worth $4 million in comparison to the costs of other supplies and critical period yield is larger than the average.

Utilities and Public Services

Configurations 1A and 1B do not include any storage facilities. However, Configuration 1C includes groundwater storage in the San Joaquin Valley and off-aqueduct surface water storage. The potential impacts associated with the development of storage facilities include increased energy consumption for pumping and relocation of minor infrastructure. These impacts are not expected to be significant.

Indirect effects of surface water storage are possible and would be similar to those discussed for Configuration 1C for the Sacramento River Region.

ALTERNATIVE 2

Ecosystem Restoration, Water Quality, Levee System Integrity, and Water Use Efficiency Programs

Urban Land Use

The nature and pattern of impacts are as described for Alternative 1.

M&I Water Supply Economics

The nature and pattern of impacts are as described for Alternative 1, except that the water transfer program may be facilitated by increased options for storage and conveyance.

Utilities and Public Services

The nature and pattern of impacts are expected to be similar to those under Alternative 1.

Storage and Conveyance

M&I Water Supply Economics

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 2A imply that the San Joaquin River Region would gain about 3,000 acre-feet per year in average years and 1,400 acre-feet per year during the critical period. These gains would provide for less than 0.5 %of demand in the average and dry year. The average year supplies are worth roughly $1 million in comparison to the cost of other supplies, but critical period yield is less than the average.

Economic analysis of changes in San Joaquin Region salinity caused by changes in Delta conveyance configuration was conducted. Configurations 2A through 2E show end-user TDS levels of 237 to 240 ppm as compared to the No Action condition of 315 ppm, as an average over 16 years. Annual economic benefits are around $1 million.

Limited information on bromide and organic carbon concentrations are available. For estimates "at Tracy PP," Configurations 2B, 2D and 2E show somewhat lower concentrations of bromide but slightly higher levels of DOC than 1A. Configuration 1A should be similar to No Action. Based on this limited information, reductions in DBP precursors in Alternative 2 should not be economically significant.

Preliminary DWRSIM results and water supply benefits are the same for Configuration 2B as those discussed for Configuration 1C.

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 2D imply that the San Joaquin River Region would gain about 5,400 acre-feet per year in average years and 6,300 acre-feet per year

during the critical period. These gains would provide for about 0.8% of demand in average years, and 0.9% of demand in dry years. The average year supplies are worth roughly $2 million in comparison to the cost of other supplies and critical period yield is larger than the average.

Preliminary DWRSIM results and water supply benefits are the same for Configuration 2E as those discussed for Configuration 1C.

Utilities and Public Services

Configuration 2A does not include storage in the San Joaquin River Region. However, Configurations 2B and 2E include surface water storage on the San Joaquin River, groundwater storage in the San Joaquin Valley, and off-aqueduct surface water storage. Configuration 2D also includes off-aqueduct surface storage.

The potential impacts to utilities and public services associated with the development of surface and groundwater storage in the region would be similar to those described for Alternative 2 for the Sacramento River Region.

ALTERNATIVE 3

Ecosystem Restoration, Water Quality, Levee System Integrity, and Water Use Efficiency Programs

Urban Land Use

The nature and pattern of impacts are as described for Alternative 1.

M&I Water Supply Economics

The nature and pattern of impacts are as described for Alternative 2 except that water transfer program economic and environmental benefits at the destination might be increased.

Utilities and Public Services

The nature and pattern of impacts are as described for Alternative 1.

Storage and Conveyance

M&I Water Supply Economics

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 3A imply that the San Joaquin River Region would gain about 4,600 acre-feet per year in average years and 3,600 acre-feet per year during the critical period. These gains would provide for about 0.5% of demand in average years, and 0.7% in dry years. The average year supplies are worth $2 million in comparison to the cost of other supplies, but critical period yield is less than the average.

Economic analysis of changes in salinity caused by changes in the Delta conveyance configuration was conducted. Salinity of Configuration 3A water deliveries is less (250 ppm) than in No Action (315 ppm), as averaged annually over 16 years. Net economic benefits are $2 million annually. In Configuration 3B, salinity is reduced to 243 ppm, for a net economic benefit of $2 million annually. In Configuration 3E, salinity is reduced to 193 ppm for a net benefit of $3 million annually in comparison to No Action.

Limited information on bromide and organic carbon concentrations are available. For estimates "at Tracy PP," Configuration 3E shows much lower concentrations of bromide and substantially lower concentrations of DOC than Configuration 1A. Configuration 1A should be similar to No Action. Based on this limited information, reductions in DBP precursors in Configuration 3E should be economically significant.

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 3B imply that the San Joaquin River Region would gain about 11,200 acre-feet per year in average years and 18,100 acre-feet per year

during the critical period. These gains would provide for about 1.6 and 3.8% of demands in the average and dry year, respectively. The average year supplies are worth $4 million, and critical period yield is larger than the average.

No additional effects on M&I water use and costs are expected for Configuration 3E, 3H, or 3I in comparison to Configuration 3B.

Utilities and Public Services

Configuration 3A does not propose new storage. The remaining configurations include surface water storage on the San Joaquin River, groundwater storage in the San Joaquin Valley, and off-aqueduct surface water storage.

Impacts and consequences would be expected to be the same as those discussed for Alternative 3 for the Sacramento River Region.

No conveyance facilities are proposed for the San Joaquin River Region. However, indirect effects from conveyance infrastructure modifications and improvements outside the region are possible for all configurations except 1A. These effects would be similar to those discussed for Configuration 1C for the Delta Region.

SWP AND CVP SERVICE AREAS OUTSIDE THE CENTRAL VALLEY

The general descriptions of Alternatives 1, 2, and 3 and the features of each alternative provided for the Delta Region are valid for the SWP and CVP Service Areas Outside the Central Valley. Except as noted below, impacts for all alternatives in the region would be similar to impacts described for those alternatives in the Delta Region. Most differences are associated with water storage and conveyance.

Table 9 provides a summary of impacts on M&I water supply in the SWP and CVP Service Areas Outside the Central Valley.

ALTERNATIVE 1

Ecosystem Restoration, Water Quality, Levee System Integrity, Coordinated Watershed Management, and Water Use Efficiency Programs

Urban Land Use

No Program alternatives are anticipated to have significant direct or indirect effects on urban land uses in SWP and CVP Service Areas Outside the Central Valley. Land owned by the Bureau of Indian Affairs in this region is located in several areas of Riverside and eastern San Diego counties; however, these lands would not be impacted by the project alternatives.

County general plans in SWP and CVP Service Areas Outside the Central Valley which could be applicable to land use impacts of the CALFED alternatives include those of Imperial, Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, and Ventura counties. Principal local plans include those of the cities of Los Angeles, Anaheim, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, and Ventura. The compatibility and consistency of potential CALFED actions with these plans is not evaluated in this programmatic-level analysis. However, all program elements will be designed to be consistent with all applicable plans.

M&I Water Supply Economics

The nature and pattern of impacts of the Ecosystem Restoration Program are as described for the Delta Region, Alternative 1.

Any water quality improvements or other benefits would affect these regions through Delta exports only. Costs and cost shares are currently unknown.

Economic Parameter	Level by Alternative (millions of dollars per year)													
	Existing Conditions	No Action	Alternative 1			Alternative 2				Alternative 3				
			0	1B	1C	2A	2B	2D	2E	3A	3B	3E	3H	3I
CALFED water supply costs	0	0	No costs available											
Other water supply costs	-91	601	601	601	466	556	466	521	466	534	442	442	442	442
Total average costs														
Drought conservation costs	63	310	310	310	310	310	310	310	310	310	310	310	310	310
Drought make-up supply costs	0	685	685	685	535	680	535	608	535	650	451	451	451	451
Total drought costs	63	995	995	995	845	990	845	918	845	960	761	761	761	761
Water quality costs					B	B	B	B	B			B		
Water conservation costs														

NOTE:
See notes from Table 5.

Table 9. Summary of Impact Analysis for Other SWP and CVP Service Areas Outside the Central Valley

No Water Quality Program actions are targeted to these regions because no watershed in the region drains to the Bay or Delta. However, water quality improvements in the Delta would affect the CVP and SWP Service Areas Outside the Central Valley through SWP exports. Costs and cost shares are currently unknown.

The nature and pattern of impacts of the Water Use Efficiency Program, Including Water Transfers are as described for the Delta Region, Alternative 1. Because these regions generally have a higher than average existing level of conservation, additional costs of conservation per unit of water saved may be higher than average. The CALFED Water Use Efficiency Input Report describes preliminary water conservation baseline levels and goals.

The CALFED water transfer program will have impacts similar to those described for the Bay Region.

Utilities and Public Services

Better water use efficiency could result in larger or more consistent flows to these areas. Changes in recreational use or economic stimulation/downward pressure that could result are unlikely to cause potentially significant impacts. Further study at the project level would be needed to be conclusive.

Storage and Conveyance

M&I Water Supply Economics

Because Configuration 1A would include no additional storage or conveyance, no substantial water supply benefits are expected. Configuration 1B would include South Delta modifications to allow export pumps to operate at their physical capacity. For Configurations 1A and 1B, preliminary DWRSIM results suggest that there will be no substantial change in water supply and water supply economics.

Preliminary water quality results also suggest no quantifiable difference from No Action conditions.

DWR has provided preliminary analysis of TDS of export water for Configuration 1C. The salinity analysis does not consider differences in the amount of storage and in the amount and timing of exports between alternatives. Rather, only differences in conveyance and intake configurations are modeled using DWR Run 472B hydrology. Results, in terms of average salinity of exports from Clifton Court, are summarized in Table 3.

Economic analysis of changes in salinity caused by changes in delta conveyance configuration was conducted. Configurations 1A and 1B have water supplies and salinity identical to No Action levels, so there is no impact. In Configuration 1C, the average TDS of delivered water is increased from 1 to 2 percent, depending on subregion, for an annual economic cost of $8 million. This adverse effect is not considered significant.

Limited information on bromide and organic carbon concentrations are available. For estimates "at Clifton Ct" Configuration 1C shows slightly lower concentrations of bromide but slightly higher DOC than in 1A. Configuration 1A should be similar to No Action. Based on this limited information, any change in DBP precursors in Configurations 1A and 1C should not be economically significant.

Preliminary DWRSIM modeling studies and yield allocation assumptions imply that the CVP and SWP Service Areas Outside the Central Valley would gain about 138,100 AF in average years and 176,700 AF in a year during the critical period. These gains would provide for about 2.4 percent of demand in average years and 4.5 percent of demand in dry years. The average year supplies are worth roughly $97 million in comparison to the cost of other supplies. During the critical period Configuration 1C would provide more water annually than during an average year.

DWR has estimated that, under least cost planning, each acre foot of Configuration 1C annual average delivery would displace about .7 acre feet of local fixed yield in the South Coast. With contingency transfers available, the ratio would improve to about .75.

Utilities and Public Services

Although storage facilities are not proposed for areas outside the Central Valley, indirect impacts on utilities are possible for several reasons: (1) electric power, possibly generated in these areas, is used to convey water throughout different areas of the state; and (2) depending on a number of factors, more or less power from these facilities could be required to accommodate new storage facilities and the associated power for increased water conveyance that could be required.

New storage facilities would affect both the amount of power supplied by hydroelectric facilities and the amount needed to convey water. Generating capacity changes could occur due to changes in reservoir volumes and flow regimes required to produce power. Depending on how new storage facilities were designed and operated, the power deficit associated with conveyance could be reduced or enlarged. A sufficient deficit could require additional power-generating capacity, resulting in potentially significant impacts.

Indirect effects could result from additional development occurring due to larger and more reliable water supplies. The increase in demand for energy and public services resulting from this development would have potential significant adverse effects.

Knowledge of the exact storage configuration chosen for development, the site of new facilities, operating procedures, and other information would be needed to determine changes in power demands outside the region and whether new capacity would be required.

The impacts to power and energy requirements resulting from increased water recycling are similar to those discussed under the Bay Region.

ALTERNATIVE 2

Ecosystem Restoration, Water Quality, Levee System Integrity, Coordinated Watershed Management, and Water Use Efficiency Programs

Urban Land Use

The nature and pattern of impacts are as described for Alternative 1.

M&I Water Supply Economics

The nature and pattern of impacts are as described for Alternative 1, except that water transfer program benefits might be increased.

Utilities and Public Services

The nature and pattern of impacts are as described for Alternative 1.

Storage and Conveyance

Urban Land Use

The nature and pattern of impacts are as described for Alternative 1.

M&I Water Supply Economics

Preliminary DWRSIM results and water supply benefits are the same for Configurations 2B and 2E as those discussed for Configuration 1C.

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 2A imply that the CVP and SWP Service Areas Outside the Central Valley would gain about 44,600 AF in average years and 19,800 AF in a year during the critical period. These gains would provide for about 0.8 percent of demand in average years, and 0.3 percent in dry years. The average year supplies are worth roughly $31 million in comparison to the cost of other supplies. During the critical period Configuration 2A would provide less water annually than during an average year.

DWR has estimated that, under least cost planning, each acre foot of Configuration 2A annual average delivery would displace about .65 acre feet of local fixed yield in the South Coast. With contingency transfers available, the ratio would improve to about .75.

DWR has provided preliminary analysis of TDS of exports for Configurations 2A, 2D and 2E. Results, in terms of average salinity of exports from Clifton Court, are summarized in Table 3.

Economic analysis of changes in SWP and CVP Service Areas Outside of Central Valley salinity caused by changes in delta conveyance configuration was conducted. Configurations 2A through 2E show end-user salinity levels reduced by 9 to 25 percent as compared to the No Action condition, depending on sub-region. Annual economic benefits are $112 to $122 million.

Limited information on bromide and organic carbon concentrations are available. For estimates "at Clifton Ct" Configurations 2B, 2D and 2E show somewhat lower concentrations of bromide and slightly higher concentrations of DOC than 1A. Configuration 1A should be similar to No Action. Based on this limited information, reductions in bromides in Alternative 2 may be economically significant, but increases in DOC are probably not significant. No economic analysis is available.

For estimates "at Clifton Ct," Configurations 2B and 2E show somewhat lower concentrations of bromide and slightly higher concentrations of DOC than Configuration 1A, which should be similar to the No Action Alternative. Based on this limited information, reductions in bromides in Alternative 2 may be economically significant, but increases in DOC are probably

not significant. No economic analysis is available.

Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 2D imply that the CVP and SWP Service Areas Outside the Central Valley would gain about 79,300 AF in average years and 91,700 AF in a year during the critical period. These gains would provide for about 1.4 percent of demand in average years and 1.5 percent of demand in dry years. The average year supplies are worth roughly $56 million. During the critical period Configuration 2D would provide slightly more water annually than during an average year.

DWR has estimated that, under least cost planning, each acre foot of Configuration 2D annual average delivery would displace about .6 acre feet of local fixed yield in the South Coast. With contingency transfers available, the ratio would be about the same.

Utilities and Public Services

Under Configurations 2B, 2D, and 2E, indirect effects to utilities associated with surface water storage and ground water storage would be similar to those described above for Configuration 1C.

ALTERNATIVE 3

Ecosystem Restoration, Water Quality, Levee System Integrity, Coordinated Watershed Management, and Water Use Efficiency Programs

Urban Land Use

The nature and pattern of impacts are as described for Alternative 1.

M&I Water Supply Economics

The nature and pattern of impacts are as described for Alternative 2, except that water transfer economic and environmental benefits at the destination might be increased.

Utilities and Public Services

The nature and pattern of impacts are as described for Alternative 1.

Storage and Conveyance

Urban Land Use

The nature and pattern of impacts are as described for Alternative 1.

M&I Water Supply Economics

No additional effect on MiI water use and costs are expected for Configurations 3E,3H, or 3I in comparison to Configuration 3B.

Preliminary DWRSIM modeling studies and yield allocation assumptions imply that the CVP and SWP Service Areas Outside the Central Valley would gain about 66,900 AF in average years and 52,100 AF in a year during the critical period. These gains would provide for about 1.2 percent of demand in average years, and 0.9 percent in dry years. The average year supplies are worth roughly $47 million annually. During the critical period Configuration 3A would provide less water annually than during an average year.

DWR has estimated that, under least cost planning, each acre foot of Configuration 3A annual average delivery would displace about .6 acre feet of local fixed yield in the South Coast. With contingency transfers available, the ratio would improve to about 0.7.

DWR has provided preliminary analysis of TDS of exports for Configurations 3A, 3B and 3E. Results, in terms of average salinity of exports from Clifton Court, were summarized in Table 3.

Economic analysis of changes in salinity caused by changes in delta conveyance configuration

was conducted. Salinity of Configuration 3A water deliveries to end-users is reduced by 7 to 21 percent, depending on sub-region, in comparison to No Action. Net economic benefits are about $100 million annually. In 3B, salinity is reduced by 8 to 24 percent for a net economic benefit of $115 million annually. In Configuration 3C, salinity is reduced by 14 to 41 percent for a net benefit of $180 million annually in comparison to No Action.

Limited information on bromide and organic carbon concentrations are available. For estimates "at Clifton Court" Configuration 3E shows much lower concentrations of bromide and substantially lower concentrations of DOC than Configuration 1A. Configuration 1A should be similar to No Action. Based on this limited information, reductions in DBP precursors in Configuration 3E should be economically significant, but no quantitative analysis is available.
Preliminary DWRSIM modeling studies and yield allocation assumptions for Configuration 3B imply that the CVP and SWP Service Areas Outside the Central Valley Region would gain about 163,600 AF in average years and 265,200 AF in a year during the critical period. These gains would provide for about 2.8 percent of demand in average years, and 4.4 percent in dry years. The CVP and SWP Service Areas Outside the Central Valley Region in the 2020 average condition would require new water to meet demands, so the average year supplies are worth roughly $115 million annually. During the critical period Configuration 3B would provide more water annually than during an average year.

DWR has estimated that, under least cost planning, each acre foot of Configuration 3B annual average delivery would displace about 0.7 acre-feet of local fixed yield in the South Coast. With contingency transfers available, the ratio would be about the same.

Utilities and Public Services

Under Configurations 3B, 3E, 3H, and 3I, indirect effects to utilities associated with surface water storage and groundwater storage would be similar to those described above for Configuration 1C.

Comparison of CALFED Alternatives to Existing Conditions

URBAN LAND USE

Comparison of Program alternatives to existing conditions indicates that:

- The potentially significant adverse effects to urban land use identified when comparing to the No Action Alternative are still significant when comparing to existing conditions.

- CALFED is proposing actions which could cause some adverse land use changes within urban communities. Under No Action urban development would continue and some adverse effects to existing communities could occur as result of that development. Adverse impacts resulting from the CALFED alternatives would be additive with other urban development effects that would occur under No Action. The combination of CALFED effects with other development effects represent the total changes with respect to existing conditions.

- The water supply reliability actions from the Water Use Efficiency, Water Quality and Storage and Conveyance program elements could improve the availability and quality of water for urban purposes above the existing condition baseline. While CALFED is expecting an overall improvement in water supply reliability for urban communities relative to the No Action Alternative, there is still the potential that the benefits provided by the Program alternatives could be insufficient to offset future conditions and the water

supply reliability could be worse than currently exists.

M&I Water Supply Economics

A comparison of CALFED alternatives to existing conditions would be similar to the comparison of CALFED alternatives to the No Action Alternative, except that (1) less urban water demands under existing conditions would decrease the value of water supplies and (2) a smaller economic base under existing conditions would reduce water quality benefits. Most regions do not require new water supplies now during average hydrologic conditions.

Utilities and Public Services

In comparison to existing conditions, as opposed to the No Action Alternative, the identified significant adverse impacts to utilities and public services would have more pronounced effects. For instance, the increase power required to convey water would be greater when compared to existing conditions. This occurs because some conveyance infrastructure would be constructed under the No Action Alternative, which would raise the baseline energy requirements above those of the existing conditions baseline.

MITIGATION STRATEGIES

The following mitigations are proposed to reduce the intensity of potential impacts. The mitigations measures are conceptual in nature and would require approval by responsible agencies.

Urban Land Use

The following measures could be implemented to mitigate potentially significant land use:

- Select and/or design program actions that minimize the displacement of existing residents.
- Select and/or design program actions that do not physically disrupt or divide established communities.
- To the extent practicable, select program actions that are consistent with local and regional land use plans. Consult and work with local jurisdictions affected by CALFED actions early in the Phase III planning and environmental review process.
- Provide advance notice of construction activities schedule to affected community members (such as residences, property owners, schools, and businesses);
- Coordinate with the applicable jurisdiction regarding future plans for projects in the area. Coordinate project design and construction with other planned projects to the greatest extent possible to avoid design conflicts and minimize construction disruption.
- Coordinate with the applicable jurisdiction and apply for a zoning or general plan change, if necessary.
- Coordinate with the applicable jurisdiction to obtain necessary permits and assign an inspector to oversee construction activities;
- During construction, maintain access to homes, schools, and businesses.
- If necessary, compensate property owners for the value of their land and associated improvements, including dwelling units, in compliance with state regulations for

providing relocation assistance to displaced persons or businesses;

- If necessary, aid in locating alternative dwelling units for displaced persons pursuant to the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970;
- Where applicable, compensate property owners for acquisition of permanent and construction easements for proposed pipelines;
- Where applicable, minimize the amount of permanent easement required for pipeline construction and select easement locations in consultation with property owners to minimize property disruption and fragmentation.
- If applicable and where feasible, relocate roads and utilities prior to project construction to ensure continued access and utility service through the project area.
- Prepare a detailed engineering and construction plan as part of the project's design plans and specifications and include procedures for rerouting roads and excavating, supporting, and filling areas around utility cables and pipes in this plan.
- Notify all affected persons in the project area of the construction plans and schedule. Make arrangements with residents and businesses regarding road detours and protection, relocation, or temporary disconnection of utility services.
- Verify utility locations through consultation with appropriate entities and field surveys (such as probing and potholing).
- Promptly reconnect disconnected cables and lines.

M&I Water Supply Economics

This analysis has identified potentially significant adverse impacts involving water quality. The hydrology and hydrodynamic analyses on which these findings were based are preliminary and subject to change. Mitigation strategies can be developed when results are confirmed. Potential mitigation strategies include relocation of water supply intakes, water treatment, alternative water supplies, or changes in operations.

Utilities and Public Services

To reduce the amount of energy required to operating the water storage and conveyance facilities, the facilities could be designed to minimize the amount of energy required for their operation and to maximize the amount of energy created through their operation. This reduction in energy requirements would reduce the need to construct additional power-generating facilities.

The potential increase in the demand for public services substantially above the existing capacity of public service agencies could be mitigated by hiring additional personnel and acquiring additional equipment.

Relocation of major infrastructure components could be mitigated by siting project facilities to avoid existing infrastructure. If this is not possible, these facilities could be designed to avoid or minimize their effect on existing infrastructure. This could include constructing overpasses, small bridges, or other structures to accommodate existing infrastructure.

POTENTIALLY SIGNIFICANT UNAVOIDABLE IMPACTS

Urban Land Use

The following items have been identified as potentially significant land use impacts under Alternatives 1, 2, and 3. Even after implementation of identified mitigation measures, these impacts may still remain significant.

- Program actions associated with the Ecosystem Restoration Program Plan, Levee System Integrity Program, or storage and conveyance components could displace existing residents in areas where those actions would be located.
- Program actions associated with the ecosystem restoration program, levee system integrity program, or storage and conveyance components could physically disrupt or divide an established community.
- Water transfers to urban areas resulting from program actions associated with the Water Transfer Program could induce growth in urban areas that otherwise would not have adequate water supplies to support such growth.

M&I Water Supply Economics

This analysis has identified no potentially significant unavoidable impacts.

Utilities and Public Services

While the design and operation of storage facilities may reduce energy requirements, they would likely not avoid the construction of additional power-generating facilities. This significant adverse impact would be unavoidable.

If mitigation measures are not successful in avoiding the relocation of major infrastructure components, the significant adverse impact would be unavoidable.

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